

BASIC STUDY OF RFID TECHNOLOGY

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ABSTRACT

RFID is abbreviation for Radio-frequency identification. RFID is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects be in line of sight with the Reader. RFID is the method for Automatic Identification of Data Capture (AIDC)^[1]. Tags stores electronics stored information. Unlike barcodes tags do not necessarily need to.

KEYWORDS: *Tags, Reader, Active, Passive, Tracking, Integrate Circuit, Antenna, Radio Signals*

Received: Nov 08, 2015; **Accepted:** Nov 19, 2015; **Published:** Nov 22, 2015; **Paper Id.:** IJEEERDEC20154

INTRODUCTION

RFID is used for identifying and tracking the tags attached to the objects. It uses electromagnetic waves for transferring the information. RFID is a general term that is used to describe a system that transmits the identity in the form of a unique serial number of an object wirelessly, using radio waves^[5]. This is sometimes referred to as contact-less technology and a typical RFID system is made up of three components: tags, readers and the host computer system.

Design

In RFID design three components are considered,

- Tags
- Readers
- Host computer

Tags

An RFID tag is a tiny radio device that is also referred to as a transponder, smart tag, smart label or radio barcode. The tag comprises of a simple silicon microchip attached to a small flat aerial and mounted on a substrate. The whole device can then be encapsulated in different materials such as plastic dependent upon its intended usage. The finished tag can be attached to an object, typically an item, box or pallet and read remotely to ascertain its identity, position or state.

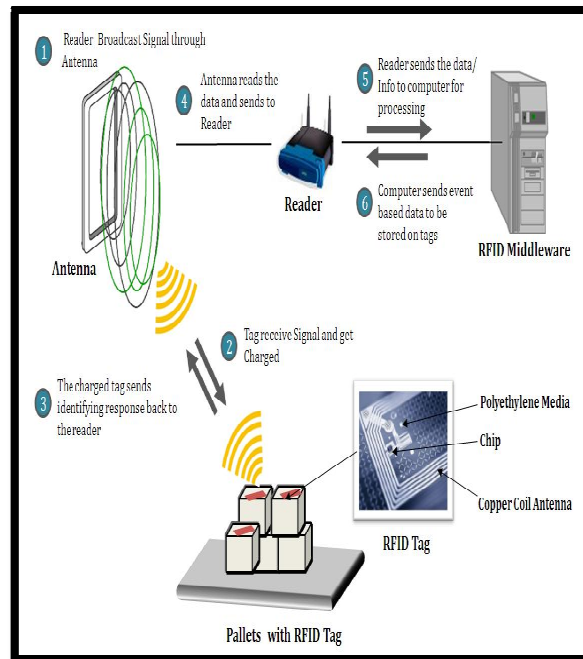


Figure 1

Readers

The reader, sometimes called an interrogator or scanner, sends and receives RF data to and from the tag via antennas. A reader may have multiple antennas that are responsible for sending and receiving radio waves. .

Tags used in RFID are of three types:

- Active Tags
- Passive Tags
- Battery Assisted Passive Tags

Active Tags: Active tags in RFID has onboard battery and periodically transmits its identification signals.

Passive Tags: Passive tags have no battery. They are using radio energy transmitted by reader. However for operation of passive tags it must be illuminated with a power level of approximately thousands of times stronger than the power used for signal transmission. This difference in power makes difference in interference and in exposure to radiations.

Battery Assisted Passive Tags: these tags have small battery on board and this battery is activated in presence of RFID reader automatically.

RFID tags contain at least two parts.

- **Integrated Circuits:** These Ics^[4] are used for storing and processing information, modulating and demodulating radio frequency.
- **Antenna:** Antenna is used for transmitting and receiving signal from tag by Reader.

Readers of RFID are of two types:

- ARPT (Active Reader Passive Tag)
- ARAT(Active Reader Passive Tag)
- PRAT (Passive Reader Active Tag)

ARPT: It has passive reader which only receive signal from active tags

ARAT: It uses active tag awoken with interrogate signal from active readers.

PRAT: Passive Reader Active Tag system has a passive reader which only receives radio signals from active tags. The reception range of a PRAT system reader can be adjusted from 1–2,000 feet or 0–600 m. It allows flexibility in applications like asset protection and supervision.

Access Control: RFID tags are widely used in identification of badges. RFID technology has replaced the earlier magnetic cards^[2]. These badges need only to be held with a certain distance from reader to authenticate the holder.

Tags can be placed on the vehicles to allow entrance in controlled areas without having to stop the vehicle and present a card or enter an access code.



Figure 2

Uses of RFID

- Access management
- Tracking of goods
- Tracking of persons and animals
- Toll collection
- Timing in sporting events
- Contactless payments
- Airport baggage tracking logistics

Signaling

Signaling between the reader and the tag is done in several different incompatible ways depending on the frequency band used by the tags. Tags operating on LF(low frequency) and HF(high frequency) bands^[7] are in terms of radio wavelength very close to the reader antenna because they are only a small percentage of a wavelength away.

In this near field region, the tag is closely coupled electrically with the transmitter in the reader. The tag can modulate the field produced by the reader by changing the electrical loading which the tag represents. By switching between lower and higher relative loads, the tag produces a change that the reader can detect. At UHF(ultra high frequency) and higher frequencies the tags are more than one radio wavelength away from the reader, requiring a different approach. The tag can backscatter a signal. Active tags may contain functionally separated transmitters and receivers, and the tag need not respond on a frequency related to the reader's interrogation signal.^[6]

EPC: Electronic Product Code is one common type of data stored in a tag. The tag contains a 96-bit string of data. The first eight bits are a header which identifies the version of the protocol. The next 28 bits identify the organization that manages the data for this tag. The next 24 bits are an object class, identifying the kind of product; the last 36 bits are a unique serial number for a particular tag. These last two fields are set by the organization that issued the tag. The total electronic product code number can be used as a key into a global database to uniquely identify a particular product.^[5]

Often more than one tag will respond to a tag reader, for example, many individual products with tags may be shipped in a common box. Collision detection is important to allow reading of data. Two different types of protocols are used to "singulate" a particular tag, allowing its data to be read in between of many similar tags.

There are drawbacks when used with many tags or with multiple overlapping readers. Bulk reading is a strategy for interrogating multiple tags at the same time, but lacks sufficient precision for inventory control.

CONCLUSIONS

RFID is used in identification of objects via wireless radio waves transmission. Unlike codebars no alignment is needed in RFID. Its uses are going to be increased.

Future Scope

RFID has been an effective method of tracking assets, products, and components through the course of any given process. RFID tags work by emitting a low-powered radio frequency transmission when passed within range of a scanner. The electronic chips inside RFID tags are being produced in increasingly smaller dimensions for rapidly falling costs. The benefits offered by RFID means it is fast becoming a real alternative for companies that need to know where their assets are within a production or distribution system. Automatically tracking individual items without requiring a line of sight. RFID technology has been successfully implemented in industries such as retail, manufacturing, public transport, and even personal banking.

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APPENDICES

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